

WHAT IS CLAIMED IS:

1 1. An improved convection/impingement oven for continuously cooking food of
2 the type having a pervious, continuous, moving belt which has an upper product
3 supporting surface referred to as a food supporting belt and a return belt portion, said
4 food supporting belt also having a lower surface, said food supporting belt conveys food
5 to be cooked from a product feed to a product discharge, said food supporting belt being
6 supported in a cooking vapor, wherein the improvement comprises:

7 a closed, elongated cooking chamber having a product feed end and a product
8 discharge end, an upper wall, a pair of side walls and a lower wall;

9 a burner assembly having an inlet supplied with outside air and an outlet feeding
10 an atmospheric pressure hot air manifold;

11 a hot air blower having an inlet in said atmospheric pressure hot air manifold and
12 an outlet in a low pressure hot air manifold;

13 a plurality of upper air impingement nozzles positioned above said food supporting
14 belt, said upper air impingement nozzles being fed from an upper air impingement
15 manifold which is, in turn, supplied from said low pressure hot air manifold;

16 a plurality of lower air impingement nozzles positioned below said lower surface
17 of said food supporting belt, said lower air impingement nozzles being fed from a lower
18 air impingement manifold which is, in turn, fed by said low pressure hot air manifold;

19 means for independently controlling the flow of hot air to said upper air
20 impingement manifold and to said lower air impingement manifold;

21 a cooking vapor vent having an inlet positioned adjacent said product discharge,
22 said oven being free of any cooking vapor recirculation, whereby said cooking vapor
23 moves concurrently with said food supporting belt and the cooking vapor velocity along

4 said food supporting belt increases as the cooking vapor approaches the product
5 discharge.

6 2. The improved convection/impingement oven of Claim 1 wherein said means
7 for independently controlling the flow of said hot air to said upper air impingement
8 manifold and said lower air impingement manifold comprises:

9 an upper burner assembly and an independently controlled lower burner assembly,
10 said upper and said lower burner assemblies each having a hot air outlet;

11 an upper and a lower hot air manifold fed by said upper and said lower burner
12 assemblies, the interiors of which are maintained at about atmospheric pressure by having
13 an air inlet conduit in the walls thereof which can draw air from outside the oven into the
14 hot air manifolds; and

15 an upper and a lower hot air blower which, in turn, have an outlet feeding said
16 upper and lower air impingement manifolds.

17 3. The improved convection/impingement oven of Claim 1 wherein said upper air
18 impingement nozzles comprise a plurality of openings in a nozzle plate and wherein at
19 least some of said openings are aimed in a downwardly direction and at least some of
20 said openings are aimed in an angled manner in the direction of the product discharge.

21 4. The improved convection/impingement oven of Claim 1 wherein said plurality
22 of upper and lower air impingement nozzles are positioned in pairs wherein an upper air
23 impingement nozzle is adjacent to a lower air impingement nozzle.

5. The improved convection/impingement oven of Claim 4 wherein said pairs of upper and lower air impingement nozzles are equally spaced from each adjacent pair.

6. The improved convection/impingement oven of Claim 1 further including a color development and sealing section comprising:

an upper color development and sealing burner positioned above said food supporting belt adjacent said product feed, said upper color development and sealing burner producing a flame which is directed downwardly and angled in the direction of said product discharge;

a branding wheel having a plurality of branding rods on the outer surface thereof, said branding rods being driven so that they move at the same speed as said food supporting belt and said branding wheel being positioned so that it is heated by the upper color development and sealing burner and said color development and sealing wheel being positionable so that its color development and sealing rods contact an upper surface of food to be cooked;

a lower color development and sealing burner positioned below said food supporting belt adjacent said product feed, said lower color development and sealing burner producing a flame which is directed upwardly and angled in the direction of the product discharge and the heat of said upper and lower color development and sealing burners heats the moving belt and is then directed fed through said closed, elongated cooking chamber and exhausted through said cooking vapor vent, whereby the heat produced by said color development and sealing burners is used to assist in the cooking of the food.

7. The improved convection/impingement oven of Claim 1 further including a plurality of steam nozzle assemblies, each steam nozzle assembly having steam outlets positioned above and below said food supporting belt.
8. The improved convection/impingement oven of Claim 7 wherein the steam nozzles positioned above said food supporting belt are fed by an upper horizontal steam manifold above said food supporting belt and the steam nozzles below said food supporting belt are fed by a lower horizontal steam manifold below said food supporting belt and said upper and lower horizontal steam manifolds comprising a pair of steam manifolds and a set of pairs of said manifolds is fed by a first steam line.
9. The improved convection/impingement oven of Claim 8 wherein there are a plurality of sets of pairs of upper and lower horizontal steam manifolds and each set is independently controlled by at least a first and second steam line.
10. The improved convection/impingement oven of Claim 1 wherein there is an upper and lower steam manifold pair between each upper air impingement nozzle.
11. The improved convection/impingement oven of Claim 6 wherein a pair of upper and lower steam manifolds and nozzles is positioned on the product discharge side of the branding wheel whereby any flame flare up resulting from the branding step will be extinguished by the steam passing through the steam nozzles.
12. An improved convection/impingement oven for continuously cooking food of the type having an endless, moving, linked belt forming a continuous loop, the upper

portion of said loop forming a moving food supporting belt for supporting the food to be cooked on its upper surface which linked belt allows heat to pass upwardly from its lower surface through said belt and to permit grease or other substances to fall through said belt, said loop having a product feed end and a product discharge end, said belt being supported along essentially all of its length in a cooking vapor, said oven being supported on a frame, wherein the improvement comprises:

an elongated cooking chamber supported by said frame, said chamber being closed at the top, bottom and sides and open at a product feed end and at a product discharge end and said chamber having upper wall portions along the length thereof and each upper wall portion having the same cross sectional area along the entire length of said chamber;

a color development and sealing assembly, supported by said frame, and having a pair of burners having flames which feed into the product feed end of said elongated cooking chamber and which flames heat the upper and lower surface of said endless belt and the upper and lower surface of any food on the upper surface of said belt;

a plurality of steam nozzle assemblies, each steam nozzle assembly having steam outlets above and below said food supporting belt, said steam nozzle assemblies being spaced along essentially the entire food supporting belt;

a plurality of air impingement assemblies supported by said frame, each air impingement assembly having an upper impingement nozzle assembly fed by an upper hot air manifold, said upper impingement nozzle assembly being supported within said cooking chamber above said food supporting belt, and each air impingement assembly having a lower impingement nozzle assembly fed by a lower hot air manifold, said lower impingement assembly being supported within said cooking chamber below said food supporting belt;

7 means for independently controlling the hot air flow to said upper hot air manifold
8 and to said lower hot air manifold; *and*

9 a cooking vapor vent supported by said frame having an inlet positioned adjacent
0 said product discharge end of said cooking chamber, said oven being free of any cooking
1 vapor recirculation, whereby said cooking vapor moves only concurrently with said
2 moving food supporting belt and the cooking vapor velocity along said food supporting
3 belt increases as the cooking vapor approaches the product discharge end of said cooking
4 chamber.

13. The improved convection/impingement oven of Claim 12 wherein said means
for independently controlling the flow of said hot air to said upper air impingement
manifold and said lower air impingement manifold comprises:

an upper burner assembly and an independently controlled lower burner assembly,
said upper and said lower burner assemblies each having a hot air outlet;

an upper and a lower hot air manifold fed by said upper and said lower burner
assemblies, the interiors of which are maintained at about atmospheric pressure by having
an air inlet conduit in the walls thereof which can draw air from outside the oven; and

an upper and a lower hot air blower which, in turn, have an outlet feeding said
upper and lower air impingement manifolds.

14. A process for continuously cooking foodstuff while being able to provide
excellent control of the properties of the cooked product, said process comprising the
steps of:

✓ placing an object to be cooked on ~~at the~~ upper surface of a perforate, moving belt;
✓ heating at least one surface of the object to be cooked with a color development

5 heating at least one surface of the object to be cooked with a color development

and sealing flame;

10 ~~heating~~ ^{color development} and sealing flame so that the heat therefrom passes
into the entrance of an elongated cooking chamber surrounding said moving belt, said
cooking chamber having a product feed and a product discharge;

11 introducing steam above and below said object to be cooked after said object has
passed said color development and sealing flame;

2 impinging the lower surface of said object to be cooked with hot air from below
3 said moving belt at a first temperature and velocity;

4 impinging the upper surface of said object to be cooked with hot air from above
5 said moving belt at a second temperature and velocity, said introducing and said two
6 impinging steps forming a cooking phase assembly and each of said cooking phase
7 assemblies producing cooking vapors;

8 passing said object to be cooked through a plurality of said cooking phase
9 assemblies while moving the cooking vapors concurrently along said elongated cooking
0 chamber without any recirculation of the cooking vapors, and said cooking vapors
1 increasing in velocity along said cooking chamber as the object to be ~~cook~~ ^{cooked} moves from
2 the product feed to the product discharge;

3 venting said cooking vapors from said cooking chamber near the product
4 discharge; and

5 removing the resulting cooked product from the moving belt.

~~15. The process of Claim 14 further including the step of:~~

~~independently controlling the steam in at least two cooking phase assemblies.~~

16. The process of Claim 15 further including the step of:
~~independently controlling the steam in three cooking phase assemblies.~~

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